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7.7-10136

CR-152630

APPLICATION OF LANDSAT SYSTEM FOR IMPROVING METHODOLOGY FOR
INVENTORY AND CLASSIFICATION OF WETLANDS.

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18 April, 1977

Type II Progress Report for Period 1 January to 31 March, 1977.

Prepared for:
National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

Publication authorized by the Director, U. S. Fish and Wildlife
Service

(E77-10136) APPLICATION OF LANDSAT SYSTEM
FOR IMPROVING METHODOLOGY FOR INVENTORY AND
CLASSIFICATION OF WETLANDS Progress Report,
1 Jan. - 31 Mar. 1977 (Northern Prairie
Wildlife Research Center) 7 p HC A02/MF A01 G3/43

N77-21503

Unclas
00136

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Application of LANDSAT System for improving methodology for inventory and classification of wetlands.		5. Report Date April 18, 1977	
		6. Performing Organization Code	
7. Author(s) David S. Gilmer (IN 300) and Edgar A. Work, Jr.		8. Performing Organization Report No.	
9. Performing Organization Name and Address U. S. Fish and Wildlife Service Northern Prairie Wildlife Research Center Jamestown, North Dakota 58401		10. Work Unit No.	
		11. Contract or Grant No. S-54049-A	
12. Sponsoring Agency Name and Address Mr. Harold Oseroff, Code 902 Goddard Space Flight Center Greenbelt, Maryland 20771		13. Type of Report and Period Covered Type II Progress Report 1 January - 31 March, 1977	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract Processing of aircraft MSS data for detection of prairie ponds and lakes was completed during this reporting period. Data were collected along 18 randomly selected transects within a 36,876 km ² area in southeastern North Dakota (FWS Survey Stratum # 46) during May and July 1975. Each sample unit was 9.66 km long by 1610 m, containing 15.5 km ² . Total area sampled by aircraft was approximately 0.8 percent of the Stratum. LANDSAT water recognition data were derived from the areas defined by the aircraft sample units using software program POSORT. LANDSAT and aircraft data sets were then compared for differences in numbers of water bodies using linear regression analysis. The purpose of the comparison was to develop correction factors which would compensate for the numerous small water bodies undetected by LANDSAT MSS sensors. Within Stratum # 46 LANDSAT pond counts, adjusted for small pond recognition, were 108 and 97 percent respectively of FWS estimates made from low-flying aircraft during May and July surveys.			
17. Key Words		18. Distribution Statement	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page)	21. No. of Pages 7	22. Price

Type II Progress Report LANDSAT-2

Title: Application of LANDSAT system for improving methodology for inventory and classification of wetlands.

LANDSAT Proposal No.: 23000

GSFC ID No. of P. I.: 300

A. Problems

No delays in our work schedule occurred during this report period.

B. Accomplishments

A primary objective of this program has been the analysis of both LANDSAT and aircraft MSS data in a double sampling experiment designed to provide an estimate of the total number of water bodies within a 36,876 km² area (Stratum 46, U. S. Fish and Wildlife Service Waterfowl Breeding Ground Survey) in southeastern North Dakota. The results of the processing of LANDSAT MSS data for detection of ponds and lakes were reported in the previous progress report (dated 7 January 1977). During this quarter we concentrated on the processing of aircraft MSS data and the analytical comparisons of these results with the LANDSAT data.

The data collection phase of this project involved the recording of aircraft MSS data in near synchronism with overpasses made by LANDSAT. LANDSAT provided an overall view of the entire Stratum 46, whereas the aircraft data were obtained on a sampling basis. Development of the sampling design occurred at the onset of the project. Basically we chose to position the aircraft flight lines coincident with flight transects which have traditionally been used by the Fish and Wildlife Service (FWS) in conducting low-level surveys of waterfowl populations and pond numbers each year during the spring and summer. The FWS transects are oriented east-west and amount to a cumulative lineal length of 1738 km (1080 miles) for the Stratum as a whole. This cumulative lineal distance was divided into 180 units each 9.66 km (6 miles) long. The sample then consisted of 18 units randomly selected from the 180 units available. Prior to sample selection the Stratum was divided into two substrata units based upon physiographic regions which exist within the stratum (i. e. Missouri Coteau and Drift Plain). The sample was allocated between substrata based on the relative areas of the two substrata. The survey aircraft were then directed to fly each of the 18 sample units at a height of 1524 m (5000 feet) above ground level. During data analysis each sample unit was considered to be a rectangle 9.66 km long by 1610 m (5280 feet) wide, the latter dimension centered on the specified transect line. Thus each sample contained 15.55 km² (6 mi²) and the 18 samples summed to a total area of 279.9 km² (108 mi²) or approximately a 0.8 percent sample. Information

on surface water features was then extracted from the aircraft MSS data for each of the 18 samples. The double sample consisted of surface water data which were derived from the LANDSAT data and which were specific to each of the 18 units sampled by the aircraft. The retrieval of sample unit data from the LANDSAT bulk data was accomplished using the software program POSORT described in our previous progress report. Upon obtaining both LANDSAT and aircraft water recognition data for the identical sample unit, a comparison of the two data sets was made. The results of this analysis are provided in the following section.

C. Significant Results

The LANDSAT and aircraft data were compared for differences in absolute numbers of water bodies in the two data sets. Because the optical resolving power of the LANDSAT MSS was large relative to many small prairie ponds usually present, numerous ponds would not be delineated in the LANDSAT data while they should have been recognized in the low altitude aircraft data. It was our intention to develop correction factors, based upon a comparison of the two data sets with which LANDSAT data could be compensated. This comparison was done using a linear regression analysis, the results of which are given in Figures 1 and 2 for data of May and July respectively. For the regression fitting of May pond data, an outlier test (Grubbs 1950:27-28) necessitated our rejection of one data point at the 0.01 level. With this one outlier omitted the coefficients of determination (r^2) were 0.65 and 0.74 for the data of May and July respectively. Standard statistical procedures (Cochran 1953:140-141) were used to adjust the LANDSAT pond counts to actual pond numbers based on the regression relationships shown in Figures 1 and 2. Using the LANDSAT derived pond data published in our previous progress report, the corrected pond numbers for Stratum 46 would be 168,813 (May) and 155,565 (July). These figures are 108 and 97 percent respectively of FWS pond number estimates which were based upon visual observations made from low-flying aircraft. It must be emphasized that this is a comparison of one estimate with another, one or both of which could be in error.

D. Publications

None during this period.

E. Recommendations

None

F. Aircraft Data

The bulk of data processed during this period has been MSS data collected from aircraft flown in support of this program.

Literature Cited

Grubbs, F. E., 1950. Sample criteria for testing outlying observations. *Annals of Mathematical Statistics*, Vol. 21.

Cochran, W. G., 1953. *Sampling Techniques*. John Wiley and Sons, Inc., New York.

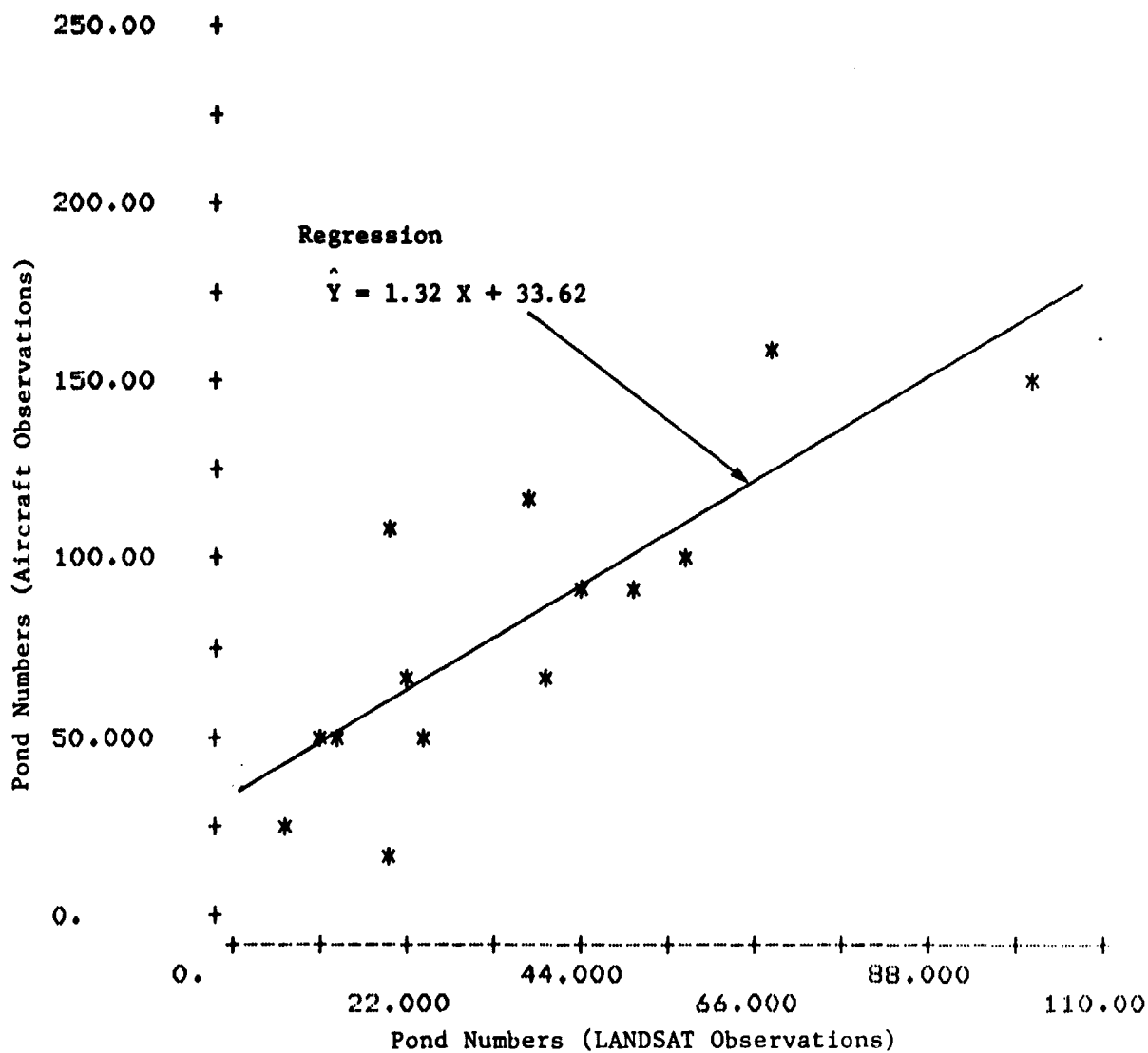


Figure 1. Sample linear regression of pond numbers (from aircraft data) on pond numbers (from LANDSAT data) for May 1975.

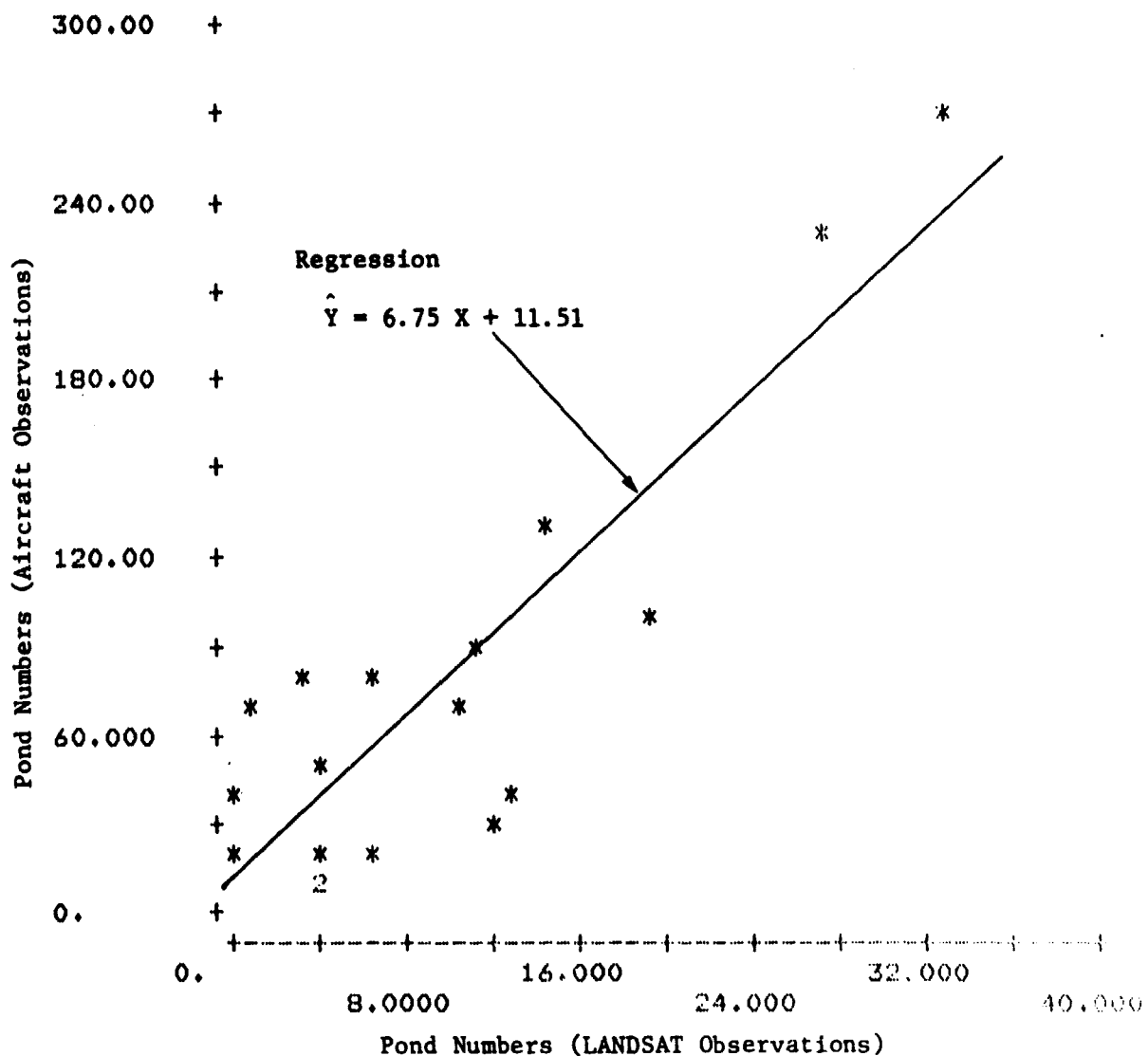


Figure 2. Sample linear regression of pond numbers (from aircraft data) on pond numbers (from LANDSAT data) for July 1975.